COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

R. Bradley Chewning, P.E.
Regional Director

April 21, 2006

Paul J. Exner
NiSource Corporate Services Company
300 Friberg Parkway
Westborough, MA 01581

Dear Mr. Exner:

I would like to thank you for your comments on the Lewis Creek Benthic Total Maximum Daily Load (TMDL) Draft Report. In addition to your comments, comments were received from Nesha Mizel and Charles Lunsford of the Virginia Department of Conservation and Recreation (DCR). DEQ has responded to each of the comments and revised the report appropriately. The revised report will now be submitted to the Environmental Protection Agency (EPA) for federal approval. After EPA approval, a final TMDL Report will be published on DEQ's website. Please see the enclosed Response to Comments Document that details the responses to all of the comments received on the draft report.

Thank you again for your involvement in the TMDL process. Please don't hesitate to call me at (540) 574-7848 if you have any other questions.

Sincerely,

Robert N. Brent

Robert Brent
Regional TMDL Coordinator

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April 21, 2006

Nesha Mizel
Department of Conservation and Recreation
44 Sanger Ln.
Suite 102
Staunton, VA 24401

Dear Ms. Mizel:

I would like to thank you for your comments on the following three Total Maximum Daily Load (TMDL) reports.

- Lewis Creek Benthic TMDL Draft Report
- Mill Creek Benthic TMDL Draft Report
- Mill Creek, Stony Creek, and North Fork Shenandoah River Bacteria TMDL Draft Report

In addition to your comments, comments on each of these reports were received from Charles Lunsford of DCR's central office. Comments on the Lewis Creek Benthic TMDL Draft Report were also received from Columbia Gas of Virginia, a NiScource Company. DEQ has responded to each of these comments and revised the final draft of the reports appropriately. Please see the enclosed Response to Comments Documents that detail the responses to all of the comments received on each draft report.

Thank you again for your continued commitment to the TMDL process. Please don't hesitate to call me at (540) 574-7848 if you have any other questions.

Sincerely,

Robert N. Brent

Robert Brent
Regional TMDL Coordinator

Response to Comments Document

Total Maximum Daily Load (TMDL) Development for Lewis Creek General Standard (Benthic)

Introduction

A final public meeting was held for the Lewis Creek benthic TMDL on March 8, 2006. The draft TMDL report (Total Maximum Daily Load (TMDL) Development for Lewis Creek General Standard (Benthic)) was presented at the meeting and made available on the Virginia Department of Environmental Quality (DEQ) website. A public comment period on the draft TMDL report was held from March 8, 2006 until April 7, 2006. During the public comment period, two groups submitted comments. Comments were received from Nesha Mizel and Charles Lunsford of the Department of Conservation and Recreation (DCR); and comments were received from Paul Exner of Columbia Gas of Virginia, a NiSource Company. These comments were prepared by Steven Peterson of Environmental Resources Management (ERM). The comments from each commenter are presented below, followed by DEQ's response to the comment.

Comments Submitted by Nesha Mizel and Charles Lunsford (DCR)

Comment 1

Page XV, next to last paragraph: "Land disturbances from mining, forest harvesting and construction accelerate erosion at varying degrees." Seems to be a statement from another TMDL report because of the reference to mining.

Response

The text was intended only to provide general examples of anthropogenic sources of sediment erosion; nonetheless, the text was modified to include examples more appropriate for the Lewis Creek watershed.

Comment 2

Page XX: It appears that "for sediment" should be added at the end of the first sentence in the first paragraph. If not, why are agricultural and urban runoff control the initial target over remediation of contaminated sites for lead and PAHs?

Response

DEQ made the suggested revision.

Comment 3

Section 3-12: A more detailed statement explaining why nitrogen was considered as a possible stressor rather than a probable stressor would be helpful since the TMDL report states that TN exceeded the PLE threshold 100% of the time during warm weather months.

Response

DEQ revised the draft report to better explain the rationale for determination of nitrogen as a possible stressor. This explanation included the fact that phosphorus is typically the limiting nutrient in freshwater streams, meaning that eutrophication is controlled by phosphorus levels regardless of how high nitrogen levels remain. In addition, controls on sediment and bacteria from sediment and bacteria TMDLs will also reduce nitrogen levels concurrently.

Comment 4
Section 5.1.3: "Sediment loads from straight pipes were reduced 100% in all scenarios due to health implications." The sediment load from straight pipes is so insignificant (.015%) that this statement is not even relevant. Suggested wording if left in the document, "Sediment loads from straight pipes were reduced 100% in all scenarios because straight pipes are illegal and should be removed for health implications due to being a source of human pathogens."

Response
DEQ made the suggested revision.

Comment 5
Section 5-2: It might be helpful to explain why creating more impervious surface area as a result of growth and expansion of commercial property in the watershed would not increase the sediment load, but rather, it would decrease it. These modeling results appear to contradict the general understanding that adding more impervious surface decreases infiltration of stormwater, which leads to both a greater sediment load being delivered to streams through rapidly moving stormwater and increased scouring on banks.

Response
DEQ revised the draft report to explain that based on modeling results, increases in stream bank erosion due to increasing imperviousness were more than offset by reductions in sediment loadings due to removal of unimproved and overgrazed pasture from production. This resulted in a modeled net decrease in sediment loadings for projected landuses. DEQ then developed the TMDL based on the current rather than projected landuses to provide a more conservative TMDL calculation.

Comment 6
Section 6.4.4: The potential funding sources mentioned will not address clean-up of contaminated sites, so using "generic" funding language in the TMDL report is misleading. There needs to be some reference to funding sources for the contaminated sites. Language in 6.4.4 applies to addressing sediment loads from agricultural, residential and urban land areas.

Response
DEQ revised the draft report to include language on funding specific to PAH and lead cleanup of contaminated sites.

Comment 7
Section 6-4: When updating site characterizations for the contaminated sites is first mentioned, it might be helpful to insert one statement regarding who would be involved in this task and when it would take place. While DEQ and EPA are mentioned as key players shortly after on page 6-5, a summary statement explaining that these two agencies would work together following completion of the TMDL to update these studies would be useful.

Response
DEQ made the suggested revision.

Comment 8
Section 6-6: If notification of the WQIF grant award for the City of Staunton is received prior to the close of the public comment period, it would be useful to include this information in this section. This project would clearly help to meet the goals of the TMDL since it has a strong

implementation component focused on reducing sediment and other pollutant loads in the Lewis Creek watershed.

Response

As of the close of the comment period, no notification of grant funding had been announced.

Comment 9

A definition of improved and unimproved pasture could be inserted in the glossary. This would be helpful in increasing public understanding of where we are proposing to implement best management practices.

Response

DEQ made the suggested revision.

Comments Submitted by Columbia Gas of Virginia, a NiSource Company

Comment 1

Reducing pollutant loadings to Lewis Creek and improving the benthic community are worthy goals. The TMDL study has identified the presence of a number of stressors within the Lewis Creek watershed that potentially contribute to the observed impairment. However, the evaluation of the possible influence of these stressors could be improved by consideration of the following main points:

Response

DEQ thanks Columbia Gas for their support of water quality goals and participation in the TMDL process. DEQ has responded to the specific comments below and made modifications to the draft TMDL report where appropriate.

Comment 2

Certain important stressors have not been identified, such as the source of water column toxicity. Because of the lack of understanding of this stressor, there is no clear plan in place to address it. The benthic community is highly sensitive to water quality, particularly the most sensitive species such as mayflies and caddisflies, which occur on hard substrate and do not burrow into sediment. Therefore, benthic community improvement is not likely to be fully achieved without identifying the cause of water column toxicity.

Response

Stressor identification analysis is an iterative process that attempts to identify the most probable stressors impacting the benthic community. As part of this iterative process, observed water column toxicity was followed by chemical analysis of water column samples under baseflow and stormflow conditions. No water quality parameters produced strong evidence of a stressor. In addition, water column toxicity test results suggested (based on the timing of effects at test renewal) that toxicity in the water column may be intermittent and primarily affected the fish test species (Pimephales promelas) rather than the invertebrate (Ceriodaphnia dubia). In the meantime, sediment toxicity results and analytical chemistry on sediment contaminants produced strong evidence of several suspect toxicants. The iterative process and the weight of evidence approach of the stressor identification analysis led in the direction of these sediment toxicants (along with the physical stressor of sediment) as the most probable stressors. This most probable stressor determination is not to mean that other *potential stressors do not affect stream health. In fact, the report identifies several other possible stressors, and additional stressors may exist as well. The three stressors identified as the most probable stressors in Lewis Creek (sediment, PAHs, and lead) are those with the greatest certainty of impact on the benthic community. While other stressors may exist, these three exert the primary control on benthic macroinvertebrate populations. Without addressing these three most probable stressors, benthic community health cannot be restored. Through implementing controls to address these stressors and bacteria, for which a TMDL was previously developed, reductions in other pollutants will also be possible. If following implementation of these TMDLs, benthic health is not restored; additional TMDL studies could be warranted.*

<u>Comment 3</u>

PAHs were identified as likely stressors in sediment. However, there are significant gaps in understanding the possible sources of these PAHs. For example, it is well established in the literature that the most important sources of PAHs in urban sediment originate from everyday fossil fuel combustion products. The report neither identifies these common sources, nor are a variety of other potential sources mentioned. Rather, there is an unsubstantiated emphasis on “contaminated sites”, with little supporting evidence linking the observed levels of PAHs in sediment to these contaminated sites. Both the concentrations of total PAHs, the locations of the most elevated levels, and dominance of pyrogenic PAHs in the mixture are consistent with urban background as a significant source.

<u>Response</u>

Urban background sources of PAHs were explicitly considered in the Lewis Creek TMDL. TMDL modeling estimated 28% of PAH loadings from background sources, and those modeled loads were calibrated to in-stream sediment concentrations in urban portions of the watershed that were not subject to influence by contaminated sites. Not only did the TMDL consider background urban sources of PAHs, but the TMDL called for a 16% reduction in PAH loads from those background urban sources. To address the comment above, the Lewis Creek TMDL was revised to: 1) further highlight urban background sources of PAHs, and 2) provide additional evidence that while background sources exist, particular emphasis on contaminated sites is warranted.

An additional section to address urban background loads was added under Section 2.6: Known and Possible Sources of Contamination to Lewis Creek. This section points out that urban background sources are a contributor to contaminant loads in Lewis Creek. General diffuse sources of lead and PAHs in the urban environment are mentioned in this section. Secondly, this section provides additional information demonstrating that a focus on contaminated sites is not unsubstantiated, as the commenter claims. This section compares sediment PAH and lead levels in Lewis Creek to other streams in Virginia and particularly to similar small urban streams in northwestern Virginia. Among streams state-wide, PAH contamination in Lewis Creek is among the 99th percentile. Lewis Creek contamination levels are also much higher than in similar urban streams that flow through Harrisonburg and Winchester, VA. This section also presents recent photos documenting seeps and sheens observed in specific locations adjacent to contaminated sites. In addition to new information provided in this section, the most compelling support for focusing on contaminated sites are the numerous site investigations and reports referenced throughout the remainder of Section 2.6 that document on-site contamination and document in-stream impacts from those sites. While some of those reports predate remediation actions at some sites, other sites have not undergone significant remediation since the reports were prepared, and ongoing impact to Lewis Creek must be assumed. In the first phase of TMDL implementation, it is these sites *(those that have not undergone significant remediation) that DEQ attempts to target through existing programs.*

Comment 4

Moreover, the linkage of benthic impairment and toxicity to PAH levels is extremely uncertain, with no clear evidence correlating concentrations and effects. PAH levels in sediment at one of the most impaired stations, 1BLEW006.95, are not clearly elevated above toxicity thresholds, yet the report repeatedly asserts that PAHs are likely to be causing benthic impairment and toxicity at this and other locations. Multiple stressors may be resulting in the observed effects, including the unexplained water column toxicity, metals such as mercury and zinc, and poor substrate conditions, among other factors. However, there is insufficient evidence to link the impairment to PAHs.

Response

As described in the Response to Comment #2 above, the stressor identification analysis used in this TMDL is an iterative process that attempts to identify, using a weight of evidence approach, the most probable stressors impacting the benthic community. In the case of Lewis Creek, multiple stressors were evident, and three most probable stressors were identified: sediment, PAHs, and lead. Specific information linked each of these stressors to benthic impairment. For the case of PAHs, sediment contaminant levels, observed sediment toxicity with co-occurring PAH hazard indices above 1, and documented historic sources with documented stream impacts all acted as corroborating evidence for PAHs as one of the three identified most probable stressors in Lewis Creek. An error in the draft report and misinterpretations by the commenter may have contributed to the commenter's concern that effects were poorly linked to PAH levels. These specific issues are addressed in Response to Comments #6, #7, and #11 below.

Comment 5

Page 2-20, Section 2.5.3. The report states that results from water column toxicity tests demonstrate significant toxicity to fathead minnow and Ceriodaphnia. No information is provided on the locations where samples were obtained, the number of tests conducted, or measurements obtained of water quality parameters from the test water. The cause of water column toxicity is not identified. These findings seem to be particularly relevant in light of the documented impairment of the Lewis Creek benthic macroinvertebrate community, yet the results are not discussed here or elsewhere in the report.

Response

The draft report was revised to provide more detailed information regarding the water column toxicity test procedures and results. In addition, see Response to Comment #2 above.

Comment 6

Page 2-29, Section 2.5.4.3; and page 2-41, Section 2.5.4.4. The discussion of PAHs is potentially misleading in presenting a Hazard Index based on Threshold Effect Concentrations (TECs) rather than Probable Effect Concentrations (PECs). It is important to point out that none of the total PAH levels at any location exceed the PEC. While a Hazard Index below the TEC is an accurate predictor of the absence of toxicity, a Hazard Index greater than the TEC but less than the PEC (which is the case for all samples in the TMDL study) is not an accurate predictor of the presence of toxicity. Thus, it would be useful to explicitly state that the four monitoring stations with Hazard Indexes exceeding 1.0 were based on comparison with the TEC rather than the PEC, and in comparison to the PEC, the data do not conclusively demonstrate toxicity.

Response

The commenter is incorrect. Hazard indices were calculated by comparing measured concentrations to PEC values, not TECs. Hazard indices were calculated as the sum of hazard quotients for individual PAH compounds compared to their respective PEC values. Not only did sites exceed hazard indices of 1, but samples exceeded individual PEC values. PECs for fluoranthene and pyrene were exceeded at station 1BLEW006.64 in May 2005 sampling. In 2001, PECs for fluoranthene, phenanthrene, pyrene, benzoanthracene, and chrysene were exceeded in sediment samples from 1BLEW005.24. The commenter is correct that PECs for total PAHs were not exceeded at any site, however, comparison of total PAHs to PEC values is problematic due to the possible differences in analytical approaches. Total PAHs are calculated as the sum of PAH compounds analyzed. While there are over 100 distinct PAH compounds, different studies have measured different subsets of those compounds. In the Lewis Creek TMDL, only 16 PAH compounds were measured. This obviously underestimates the true total PAH concentration.

Comment 7

Page 2-42, Section 2.5.4.4. The statement that the results of the toxicity tests "are consistent with the results for the hazard quotients for PAHs at all three monitoring stations (considering both the May 2nd and Oct 5th results)" may require further explanation. Although toxicity was present for Chironomus in tests from these locations, the greatest toxicity (40% survival) was observed at the farthest downstream station (1BLEW000.61) where the PAH Hazard Index (based on the TEC) was only 0.04, based on the October 5, 2005 data. The statement appears to imply that the toxicity measured in samples collected in October 2005 can be explained by chemical data collected in May 2005, but clearly there is a significant discrepancy between the observed toxicity and the absence of PAHs in the October sample. It is questionable to disregard the PAH data from the October event, solely because it is not consistent with the toxicity data. Similarly, it is not appropriate to explain the incongruous toxicity observed with the October sample based on data collected in May 2005. Rather, the toxicity observed at this location may be attributable to other constituents (e.g., mercury and zinc), which exceeded TECs at these stations in October 2005.

Response

There was an error in the draft TMDL report that led to the commenter's concerns. The report implied a Chironomus tentans survival of 87% at 1BLEW006.95 and 40% at 1BLEW000.61. The values presented were actually mortality, rather than survival. DEQ revised the report to state the correct survival percentages of 13% at 1BLEW006.95 and 60% at 1BLEW000.61. DEQ also expanded the discussion of sediment toxicity testing, removed mention of May 2005 sampling results, and provided better linkage between observed toxicity and measured pollutants. It was explained that toxicity results were likely due to multiple stressors. Both sites (1BLEW006.95 and 1BLEW006.64) that showed toxicity compared to the reference station had PAH hazard quotients greater than 1. The station with the greatest observed toxicity (1BLEW006.95) had the highest lead concentration, which was very near the PEC value (125 mg/kg compared to the PEC of 128 mg/kg). For these reasons, lead and PAHs were identified as most probable stressors.

Comment 8

Page 2-44, Table 2.33. The sample date of May 2, 2005 appears to be a typo and should be replaced with October 5, 2005.

Response

DEQ made the suggested correction.

Comment 9

Pages 2-44 through 2-64, Section 2.6. This section describes certain known and possible sources of contamination, but contains some important omissions. In particular, sources of PAHs to urbanized watersheds include many ubiquitous sources such as airborne particles and soot from industrial air emissions and vehicle exhaust, crankcase oil, and weathering of road paving asphalt. In fact, numerous studies have established that the principle sources of PAHs in many urban watersheds are a combination of these common urban "background" sources (e.g., Stout et al., 2004, Comparative Evaluation of Background Anthropogenic Hydrocarbons in Surficial Sediments form Nine Urban Waterways, Environmental Science and Technology 38:2987-2994). Note that the locations evaluated by Stout et al. include two urban watersheds in Virginia. The concentrations of total PAHs in these urban background sediments is typically less than 20 mg/kg, which is consistent with the concentrations reported for Lewis Creek. In fact, many of the samples collected from Lewis Creek had nondetectable PAHs.

Response

See Response to Comment #3 above for general discussion of urban background sources and modifications to the TMDL report to better address those sources. DEQ reviewed the Stout et al., 2004 paper referenced by the commenter, but disagrees that this paper provides urban background PAH levels suitable for comparison to Lewis Creek. All of the sites selected by Stout et al. were large ports or harbors, and none were free flowing streams, such as Lewis Creek. The sediment deposition characteristics in deep, slow moving, often tidally-influenced harbors is completely different from sediment deposition in a first or second order Ridge and Valley EcoRegion stream such as Lewis Creek. Harbors are known to be sediment and contaminant sinks, with very little sediment movement out of the system. DEQ also disagrees that the sites selected by Stout et al. represent urban background conditions at all similar to Lewis Creek. The Lewis Creek watershed consists of approximately 22% urban land uses and includes the City of Staunton, Virginia, with a population of approximately 24,000. This is hardly comparable to the urban conditions represented by sites selected by Stout et al., which include SanFransisco Bay, Long Island Sound, Boston Harbor, or the Elizabeth River in Norfolk, Virginia. The harbors and bays selected by Stout et al. are also navigatable waterways subject to intense boat traffic, a significant source of petroleum products not present in Lewis Creek. Lastly, DEQ disagrees that the sites selected by Stout et al. represent merely background urban sources of petroleum contamination. For instance, the two sites within Virginia (Elizabeth River and Quantico) are known to be moderately to heavily contaminated. DEQ's 2004 Water Quality Assessment Report states that the Elizabeth River is one of the most highly polluted bodies of water in the entire Chesapeake Bay watershed. The Elizabeth River has had a long history of contamination from military and industrial activities as well as commercial shipping. The Elizabeth River system is hardly identified as an example of a watershed only influenced by urban background sources. Likewise, Quantico has long been the site of a military installation, which is a part of DEQ's Federal Facilities Program addressing on-site contamination.

Based on the above mentioned concerns regarding the selection of urban background sites by Stout et al. and the comparability of these sites with Lewis Creek, DEQ disagrees that the 20 mg/kg benchmark for urban background concentrations is applicable to Lewis Creek. To provide an alternative comparison of background loads, DEQ analyzed data from Virginia's fish tissue and sediment sampling program. Among stream sediment PAH levels, Lewis Creek ranked in the 99th percentile state-wide. Lewis Creek sediment PAH levels were also *much higher than comparable urban streams in northwestern Virginia (Blacks Run in Harrisonburg, Virginia; and Abrams Creek in Winchester, Virginia).*

<u>Comment 10</u>

Several of the specific sampling locations in the Lewis Creek TMDL study appear to be possibly influenced by typical urban background. For example, an asphalt paving company has a facility located adjacent to Lewis Creek just downstream of the sampling station 1BLEW006.95 at the Virginia School for Blind and Deaf, and just a few hundred feet upstream of 1BLEW006.64, the most contaminated station in the watershed. This sampling station is located over one mile downstream of the contaminated sites mentioned in Section 2.6. Indeed, the PAH levels at 1BLEW006.95 (upstream of the paving company) are consistently several times lower than the levels at 1BLEW006.64 (downstream of the paving company). If the contaminated sites were the primary sources of PAHs to Lewis Creek, as the report alleges, it would be reasonable to expect that higher concentrations would be observed just downstream of these sites at 1BLEW006.95, yet they are not. This fact is inconsistent with the known or identified contaminated sites being important continuing sources of PAHs to Lewis Creek. As the data show, the depositional characteristics of the various sampling locations do not differ greatly, so there is no reason to believe that PAHs generated from farther upstream would preferentially deposit at 1BLEW006.64 and not at intervening locations. This suggests a possible source of PAHs that has been overlooked between points 1BLEW006.95 and 1BLEW006.64. While the paving company is one such obvious candidate as a source, there are other potential sources of urban runoff that could contribute, including a large outfall that discharges directly to the stream at 1BLEW006.64.

<u>Response</u>

As mentioned in Response to Comment #3 above, DEQ explicitly considered background urban loads in the development of the Lewis Creek TMDL. The paving company identified by the commenter would be considered as a potential contributor to that background load. There was no specific evidence to suggest that this site contains contamination that would significantly contribute above other general background sources. There have never been any reports of discharges or sheens emanating from this site despite relatively high traffic and recreational fishing use at this point on the stream. DEQ responded to and satisfactorily closed a petroleum tank case at this company in 1990, but no recent issues have been identified. If additional evidence suggesting contamination at this site becomes available, it will be investigated by the appropriate DEQ program.

Regarding the differences in PAH levels between sites 1BLEW006.64 and 1BLEW006.95, higher levels at 1BLEW006.64 are not necessarily inconsistent with a primary source upstream from both sites. Within such a short stream distance (0.3 miles), it is not uncommon for contaminant levels in sediment to fluctuate rather than maintain a consistent downstream reduction. In fact, this fluctuation was demonstrated nicely in ERM's Site Characterization Report prepared for Columbia Gas. Within a stream segment beginning under Greenville Avenue bridge (adjacent to Beverley Exxon) to approximately 500 meters downstream, total PAH levels were 71.8, 0.96, 6.11, 5.65, 26.32, and 1.47 mg/kg moving downstream. Such fluctuations moving away from a source can be accounted for by sediment dynamics, stream conditions, and sampling and analytical variability. One noticeable difference between sites 1BLEW006.95 and 1BLEW006.64 was that stream gradients appeared to be higher at 1BLEW006.95 than 1BLEW006.64. Sediment deposits for sampling were more prevalent at 1BLEW006.64 than at 1BLEW006.95 (with the exception of deposits behind a debris dam at the 1BLEW006.95 location).

Comment 11

Page 3-9, Section 3.2.5. The statement linking sediment toxicity at 1BLEW006.95 to the observed benthic impairment may need to be reconsidered. For example, the comparison of benthic organism abundance in this section indicates that fewer organisms were found at 1BLEW006.95 compared with both downstream and upstream stations. Yet toxicity for Chironomus was actually greater at the farthest downstream station, 1BLEW000.61 (40% survival) compared with Chironomus toxicity at 1BLEW006.95 (87% survival). This fact is not consistent with the greater organism abundance at 1BLEW000.61 (the more toxic station) compared with 1BLEW006.95 (the less toxic station). In addition, the data indicate that the most abundant organisms at both locations are Chrironomids, the same types of organisms used in the toxicity tests. Thus, it appears that the relative abundance of these organisms is not clearly correlated with the results of the toxicity tests at these two stations. The linkage of sediment toxicity to observed patterns of abundance and diversity has not been clearly demonstrated in the TMDL study, indicating that something other than sediment toxicity may be playing an important role in controlling invertebrate abundance in Lewis Creek.

Response

As mentioned in the Response to Comment #7, there was an error in the draft TMDL report that may resolve the commenter's concerns. The most toxic site in sediment toxicity testing was 1BLEW006.95, which is consistent with the low abundance scores at this site. Site 1BLEW006.95 averaged 70% fewer organisms than 1BLEW000.61 and 80% fewer than 1BLEW009.19. Regarding the presence of Chironomids, the commenter is incorrect in stating that Chironomids were the most abundant organisms at both locations. Chironomids were the most abundant organisms at 1BLEW000.61, comprising 42% of the benthic assemblage, but Chironomids were not the most abundant organisms at 1BLEW006.95, where they comprised 25% of the total benthic assemblage. The dominance of Chironomids at 1BLEW000.61 is consistent with sediment as the primary stressor at that station, while the low overall abundance at 1BLEW006.95 is consistent with toxics as the primary stressor. Lastly, the commenter implies that the presence of Chironomids is inconsistent with sediment toxicity test results that showed toxicity to Chironomus tentans. This is not necessarily the case. DEQ used EPA's Rapid Bioassessment Protocol for performing biological assessments on Lewis Creek. This protocol relies on only family-level taxonomic identification of macroinvertebrates. The Chironomidae family, which includes Chironomus tentans, is the most diverse and abundant family of aquatic organisms (Voshell, J.R., 2002; A Guide to Common Freshwater Invertebrates of North America; McDonald and Woodward Publishing Company, Blacksburg, VA). Tolerance values for individual species within the family range from 0 to 10 on a scale of 0 to 10. Chironomus tentans has a tolerance value of 6, meaning that many Chironomids are more sensitive than Chironomus tentans and many are less sensitive. Based on these facts, one would not expect an extirpation of Chironomids (identified at the family level) simply based on toxicity to Chironomus tentans. One would, however, expect a reduction in abundance, which is exactly what was observed.

Comment 12

Section 3.4.2. This section contains a questionable attribution of high PAH levels from a single sample collected in 2001 to potential releases from coal gasification plant sites. There is little evidence presented to support this assertion, other than a table with selected results from historical (pre-remedial) investigations at these sites. In addition, the sediment sample from 2001 discussed in this section does not seem to be representative of PAH concentrations found elsewhere in Lewis Creek. Moreover, this sample location is not identified but it appears to be taken from river mile 5, well downstream of the former coal gasification facilities. As indicated in earlier comments, there are other sources of PAHs that occur both upstream and downstream of the coal gasification sites.

Response

As mentioned in the Response to Comment #3 above, DEQ has revised the draft report to be inclusive of additional PAH sources, including urban background. At the same time, DEQ has revised the draft report to provide additional support for a primary focus on contaminated sites. Such support includes documentation of contaminant levels in soil and groundwater at the sites, documentation of stream sediment contamination at the sites, comparison of Lewis Creek sediment contamination with other local urban streams, recent photo evidence of seeps and sheens adjacent to contaminated sites, and mass balance modeling of contaminants showing that in-stream sediment concentrations cannot be accounted for by background sources alone.

The commenter is correct in that some evidence presented predates remedial actions at some sites. For PAHs, this basically only applies to the Columbia Gas site. The report documents the remediation activities performed at that site, clearly states that data from site characterization reports predate remediation activities at the site, and even suggests that those remediation activities may be responsible for observed reductions in in-stream PAH levels from 2001 to 2005. The TMDL also recommends that revised site characterization studies be conducted at sites where existing data does not reflect remediation activities. Columbia Gas is currently in the process of performing that task under the Voluntary Remediation Program. With the exception of the Columbia Gas site, no other sites have undergone significant remediation for PAHs. For this reason, the TMDL sets out a plan for implementation that first targets those sites that have not undergone significant remediation.

Comment 13

This section continues with a discussion of the relationship of the composition of PAHs in sediment to possible sources, based on analysis of the ratios of certain PAHs, e.g., the phenanthrene/anthracene ratio and the fluoranthene/pyrene ratio. The evaluation of the ratios of priority pollutant PAHs can be a useful indication of whether sources can be generally categorized as broadly pyrogenic or petrogenic. For example, the PAH ratios from Lewis Creek are consistent with a predominantly pyrogenic source. This is not surprising, however, given that most urban background sources are pyrogenic. Within the pyrogenic category of sources, there is a broad range of signatures that vary depending on location, the precise chemical nature of the source material, and weathering, among other factors. The ratio analysis presented in the TMDL report is too simplistic to be used as a way of attributing PAHs in sediment to specific sources. Based on current literature (e.g., Stout et al. 2004 and many other publications), fingerprinting PAHs in complex mixtures that are likely derived from multiple sources requires analysis of over 40 individual compounds, including both parent and alkylated PAHs, using more sensitive methods that allow detection at the low ambient levels characteristic of most urban settings. A definitive attribution of the source of PAHs in Lewis Creek cannot reliably be made with the data presented in the TMDL study report.

Response

The draft report was revised to clarify that the PAH compound ratio technique identified in the report is not a definitive technique for source identification. It is an additional diagnostic tool useful in narrowing potential sources. The results provide evidence that the primary sources are pyrogenic and not petrogenic. The results also show that the closest match to sources identified by Neff et al., 2004 was with coal tar. This finding is consistent with *documented sources in the watershed, but is not definitive proof of a single primary source. For this reason (and others), the TMDL considered a lumped contaminated site source load, rather than partitioning individual load allocations to individual sites.*